astigmatism, and chromatic aberration, and their remedies, are all fully considered. A useful bibliography is also appended to each chapter.

Les Levers Photographiques, et la Photographie en Voyage. By Dr. Gustave Le Bon. Part I. (Paris: Gauthier-Villars et Fils, 1889.)

THIS work treats of methods of obtaining by means of photography elevations and plans of monuments, buildings, &c., the intention being to render unnecessary the laborious tasks and long calculations which up to the present time have been unavoidable.

The modifications a camera has to undergo before operations are begun consist of the addition, first, of an india-rubber support fitted between the camera and the tripod, and, secondly, of a graduated ground glass in the place of a plain one. The india-rubber support is to enable the camera always to assume a horizontal position in whatever position the tripod may be; the ground glass thus being parallel to the face of the building which is about to be photographed. There is also an arrangement by which the camera can be rotated. By means of the ground glass the dimensions of objects can be easily measured, and horizontal and vertical angles can be read off.

The first few chapters relate to methods of graduating this glass, and its employment in the measurement of angular distances, also the mode of determining the focal lengths of the lenses employed, and the measurement of the sizes of objects after they have been photographed. Chapter v. treats of the general principles of photographic perspective, followed by the applications of those principles to the solutions of various problems, such as, "To determine the height of an inaccessible tower by a single photograph;" "To obtain without any measurement on the object itself its various dimensions," &c. Lastly, Chapter vi. deals with photographic triangulation and methods of measuring large base lines.

The International Annual of Anthony's Photographic Bulletin. Edited by W. J. Harrison, F.G.S., and A. H. Elliot, Ph.D., F.C.S. (London: Illiffe and Son, 1889.)

THIS is the second issue of an interesting and useful work. The number of articles has been considerably increased, and there is also an increase in the number of tables at the end, which will be of service both to professional and to amateur photographers. Various methods of printing are displayed in the illustrations. Two pretty views are given, one of which is taken with Dallmeyer's long-focus rapid landscape lens, and the other with his wide-angle landscape lens, showing well the effect of these different focus lenses. No pains seem to have been spared to make this issue surpass the first one, and the editors are to be congratulated on the results of their labours.

Industrial Education. By Sir Philip Magnus. (London: Kegan Paul, Trench, and Co.)

THE articles and addresses brought together in this volume form a valuable contribution to the study of one of the most important and interesting questions of the present day. Sir Philip Magnus has not attempted to exhaust his subject, or to deal with it systematically. He merely presents it from various points of view, offering suggestions as to the urgent need for a proper technical training, and as to the methods which may be most fitly used for the attainment of the ends in view. Every page bears witness not only to the writer's general knowledge and ability, but to his practical familiarity with all the aspects of the problems he discusses. One of the best papers in the book is that in which he gives an account of the school system of Bavaria, whose educational arrangements are not so well understood in this country as those of Prussia. No one who reads this paper, and takes into account all that has been done for education in the other States of Germany, will find much difficulty in explaining the fact that in industry and trade the Germans have become our most formidable competitors. Another excellent paper is on mercantile training, and there is also a good paper on technical instruction in elementary schools.

LETTERS TO THE EDITOR.

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of* NATURE. *No notice is taken of anonymous communications.*]

An Index to Science.

I AM glad to see that Mr. Taylor Kay has again brought forward the question of a subject index to scientific periodicals. I say again, because the proposal to make such an index was suggested by me in a short letter in NATURE, vol. xviii. p. 251, and more fully at the first meeting of the Library Association at Oxford, in October 1878 (Transactions of Library Association, 1878, p. 85). Dr. Garnett also read a paper before the same Association on this subject in 1879, which was fully printed in NATURE, vol. xx. p. 554. In my original letter I suggested making the index from the papers themselves, and not from the Royal Society's Catalogue; my reason for this was the difficulty that must be experienced in indexing many papers, should the indexer have nothing but the title in front of him. Reference to the paper is absolutely necessary in many instances, especially when the title does not fully set forth its contents. Dr. Garnett, however, pointed out that much labour might be saved if the Royal Society would give two copies of its Catalogue of Scientific Papers, which might be cut up to form the copy of the subject-index. There can be no doubt that Dr. Garnett is right, because, by his plan, however many papers it might be necessary to refer to, the amount of labour as regards manuscript would be very materially diminished. The greatest difficulty of all is the money. Mr. Taylor Kay takes comfort in a Treasury Minute of November 1864, and hopes, from that, that help might be obtained from the Government. I am afraid, however, it will damp his ardour to be told that the Government have refused to bear the cost of printing the Catalogue for the decade 1874–83, although the matter is all ready for the press. It seems to me that, as suggested in my original paper, the co-operation of the learned Societies is the only way in which the necessary funds can be obtained.

I gather from Mr. Taylor Kay's paper that he rather suggests a "classified" list of papers. If that be so, I would like to protest against such an undertaking, feeling sure that it will, like all its predecessors, be doomed to failure. What is wanted is an index pure and simple, in which information can be turned up without consideration as to what "class" or "classes" the indexer has thought fit to enter the subject under. Anyone who has used the admirable catalogue of Dr. Billings will at once admit its superiority to any "classified" arrangement, whether it be that of Comte or of any other philosopher.

The question of this index has been hanging fire too long, and I should be delighted if Mr. Taylor Kay's paper were the means of some active steps being taken to start the work. Poole's Index is a standing answer to those who say it cannot be done. All that we want are willing hands and a long purse: if the scientific Societies or an enterprising publisher will find the latter, I cannot believe the former will be wanting.

JAMES BLAKE BAILEY.

Royal College of Surgeons, July 5.

A Cordial Recognition.

I HAVE just witnessed a curious case of bird instinct which seems worth recording. A gardener living at Zukaleriá, three miles from here, caught in his garden a young but fully fledged sparrow, which he brought to the house of a friend with whom

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we are staying in Canea, leaving home early in the morning. He presented the bird to one of the children in the house, and it was put in a cage and hung at the window, where it seemed likely to be contented, losing its fright after a few hours. Late in the afternoon an old bird was noticed fluttering about the cage apparently trying to get at the little one, and the young bird on its appearance became frantic to get out to the old one. It was evidently the mother of the young one, as the recognition was too cordial to have been owing to the interest of a strange bird; and when my daughter opened the cage, as she did after a little, they both flew off rapidly in the direction of Zukaleriá. It is impossible that the old bird should have followed the gardener, as we should have seen it earlier in the day.

Canea, Crete, June 27. W. J. STILLMAN.

Seismology in Italy.

I HAVE only lately seen Dr. Johnston-Lavis's article in NATURE (vol. xxxix. p. 329), on the present state of seismology in Italy. I have read it with much interest, and with the greatest satisfaction, because it deals with the most recent works due to the new and serious impulse given to the study by the Government during the last five years. I thank the author for having noticed one of my writings, "Sulla sistemazione delle osservazioni geodinamiche regolari." There is little—hardly anything—absolutely new in this work, because in writing it I desired only to sum up the deliberations of the Royal Geodynamical Commission, to which I had the honour to belong. I also brought together in it all that was really serious and positive in other works, with the intention of dispelling the confusion which unhappily prevailed when this scientific branch was in the power of dilettantism, which had the prerogative of the long-winded style, the charlatanism, and the seismic magic, of which the author of the article justly complains. In a word, I wished to set forth a proper programme, with the ideas which the Commission conceived, and which continue to form the principle of the deliberations of the directing Council for Meteorology and Geodynamics, in which the Commission has been merged. On this serious and well-determined principle the service is continued in the island of Ischia as elsewhere.

In accordance with the just ideas of your correspondent, I must nevertheless make one remark on the subjects which relate more especially to the studies carried on in the island of Ischia; namely, that there is really something of novelty in some of the other writings of mine included in the volume that contains the work commented on.

One of these writings consisted of the theoretical relation I presented in response to the demand of the Royal Geodynamical Commission in the sittings of June 1886. The approval of this work by the Commission contributed to the adoption, for the study of the form of seismic movements, of the mechanical principle of three components adapted to a steady point. This principle was studied, and put into execution, by the mechanicians Brassart of the Central Office of Meteorology and Geodynamics; and while it has tended to simplify completely the methods used in the observation of earthquakes, and to bring to an end the innumerable imperfections of former times, it is not even yet well understood by men of the old school.

Three of my works relate to the variations observed in the temperature of the thermal springs at Porto d'Ischia. A rigorously mathematical analysis has revealed a hydrostatical law in relation to changes in the level of the sea. Later studies which I undertook upon the diagrams of a registering thermometer, and which the Director, Prof. Tacchini, presented to the Accademia dei Lincei on October 7, 1888, proved the influence exerted by the horary state of the tide, while previously some isolated observations had made way for hypotheses of another nature.

Another of my works expounds a new principle for rendering astatic—or nearly so—in a horizontal direction, the steady point in seismographs, and gives a mathematical demonstration of it. Upon this principle, which I conceived in 1886, is apparently based the construction of an instrument by Prof. Ames (see the *American Journal of Science*, February 1888, p. 106); but the fact that he has made the suspension with four threads, instead of three, suffices to prove that he has not formed a precise idea of my original principle, and that he has much less considered it necessary to procure for himself the mathematical proof of it. Some months before the publication of Mr. Ames's work I took care to bring out prominently, on p. 266 of the volume referred to, the error to which one would expose oneself in this way.

Of the ten writings by me in the volume, these are the works to which I attach some importance; and I take the liberty of directing to them the attention of your readers, in the hope of making known the beginnings of the success which is to be achieved through the action of the Italian Government. For the rest, the history of this enterprise is set forth in the abstract of the sittings which forms the introduction of the volume.

GIULIO GRABLOVITZ,
Director of the Osservatorio Geodinamico
di Casamicciola.

Saxicava Borings and Valves in a Boulder Clay Erratic.

WHEN examining a few weeks ago the boulders in the workings of the New Ferry Brick and Tile Company, Cheshire, with Mr. Harnett Harrisson, we discovered a boulder having superficially a scoriaceous appearance, which on examination proved to be of limestone, and perforated with Saxicava and other borings. After careful washing several of the burrows were found to be occupied by the shells of the animal that had made them, both valves complete. The washings that came out of the burrows after careful reduction by pouring off the clay water I found to consist of well-rounded grains of quartz intermixed with a few microscopic drift pebbles and small shell fragments. Some of them were very much rounded and waterworn. Several broken spines of Echinus also occurred.

The stone was taken from a heap picked out of the boulder clay previous to passing it through the machine. There is no doubt as to its origin, as one side is strongly planed and striated in the direction of the longer axis. The extreme measurements are $6\frac{1}{2}'' \times 4\frac{1}{2}'' \times 2\frac{3}{4}''$; weight, 3 lbs. 10 oz. The Saxicava burrows are placed so as to give the idea that the stone had lain on the glaciated side when most of them were made, as they get nearly horizontal towards the glaciated bottom. The termination of one burrow, however, occurs on the planed face. There are also other worm-like burrows which occur on the glaciated face, and one of them has been cut longitudinally for a length of an inch by the plane of glaciation.

It is now about eighteen years since I commenced a study of the glacial deposits of the north-west of England, but have never found a similar example with the burrows occupied, although the low-level boulder clay in which it occurs is almost universally more or less full of shell fragments. The bearing of the discovery on the origin of the low-level boulder clay is obvious.

The history of the stone appears to have been this. It had its origin in the Carboniferous limestone of the north; it has then been rounded into a boulder, has lain upon a shore, and become the seat of operations of molluscan and other burrowers. Afterwards it has been frozen into coast-ice, glaciated by attrition on a pebbly or rocky shore through tidal movement, has been again released from the ice grip, spent another time on the shore resting on its glaciated face, during which period it became perforated with the Saxicava burrows now occupied by the remains of the animal. While still on the shore, fragments of shells of other Mollusca got washed into the occupied and unoccupied perforations, and finally it was again frozen into coast-ice, floated off, and dropped into the bed of the low-level boulder clay sea, where it remained undisturbed until the pick of the brickmaker disinterred it. The boulder clay in which it occurs is plastic, and contains comparatively few stones, and there are no sand seams to be seen in the present face, though I believe they occur at a greater depth below the bottom of the pit.

The special interest of this example lies in the proof it affords of the marine origin of the low-level boulder clay of Cheshire and Lancashire. Some geologists contend that this clay is the bottom of the Irish Sea ploughed up by land ice, but the necessities of a theory that requires such an operation to have taken place in the past when there is an obvious and simple explanation at hand does not commend it to my mind. It is not even proved that such a ploughing up is possible; no examples are adduced where such a phenomenon is going on; it does not account for the structure of the beds of low-level boulder clay; and speaking from eighteen years of close investigation, there is no necessity in the nature of the case for resorting to such an extreme hypothesis.

The age of land ice preceded that of the low-level marine

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